STANDARDS

DVB/DAVIC

This standard is also known as DVB-RCC and as ETS 300 800. Initially run by DAVIC, but now the work has moved to DVB. Very few vendors develop for this standard, but enough that it does play a role. This standard is fighting the EuroDOCSIS standard for the European market (see below).

This standard is based on fixed cell size (ATM) and includes all the standard ways of doing quality of service (QoS) that ATM is known for. In that way, the standard is very well suited to both data i.e. TCP/IP (using AAL5) and telephony as pure ATM. VoIP to the cable modem may not be the best solution, although technically feasible. Initially the standard lacked security (encryption), but that was added as an option in version 1.4.

Open to both internal and external implementations, and also covering Set-Top Box implementations with an additional out-of-band receive data channel. Some of the European cable operators joined forces and made a request for proposals for a EuroModem. The specification is available to the public from EuroCableLabs for free, and even though it does not seem very big, it does refer to other standards including ETS 300 800 for the details. A PDF of the specification is available here.

MCNS/DOCSIS

The dominant US standard - even though it has not gone through any formal/independent standards body yet. This standard is very much driven by the wish of the large cable operators to have cable modems sold through the retail channel. Initially the chip manufacturer Broadcom played an important role, by pushing the standard and the level of chip integration at a very fast pace. As a result, the complexity of the standard is generally agreed to be much higher than what is strictly required, and is even growing. Initially the standard did not support QoS which is required for telephony applications (VoIP) and other applications as well, but this has been added in version 1.1. Initially open to only external box solutions with Ethernet interface, but now also allows internal modems andinternal modems andUSB modems. Host based processing solutions is still debated (start 1999).

While originally targeted at the US domestic market, an off-spring named EuroDOCSIS is being pushed as the solution to the DVB centric European market. EuroDOCSIS is essentially the same as DOCSIS apart from the physical layer, which is DVB compliant in EuroDOCSIS.

IEEE

Lost the 1st round of the Cable Modem standards battle. What happens down the road remains

to be seen. It looks like part of the IEEE group is working with Broadcom and Terayon on the next generation physical layer with increased (30 Mbps) upstream bitrate. This has also been termed DOCSIS 1.2, even though that does not seem to be official, and is certainly not approved by the DOCSIS vendor community yet.

The DVB-RCC vs. EuroDOCSIS fight

The battle for the US domestic market is clearly won by the DOCSIS standard, but the battle for the European market is still going on. It does not seem like at very fair match, but nevertheless quite interesting. The following somewhat biased "whitepapers" are among the most visible parts of the fight.

October 1998: Gregers Kronborg who is Chairman DVB/DAVIC Interoperability Consortium but also co-founder of DVB cable modem manufacturer COCOM writes this: Comparing DVB RCC / DAVIC with OpenCable MCNS (PDF file- also available on the DVB website www.dvb.org). May 1999: Tom Quigley from Broadcom Corporation presents his "whitepaper" Euro-DOCSIS/DVB-RC Comparison (PDF file - also available on the CableLabs website www.cablemodem.com on a EuroDOCSIS promotion tour of some European countries (Stockholm, Vienna, Paris, Zeist and London).

May 1999: Henry Barton who is MD for Broadcentric Ltd. publishes another similar but much more detailed "whitepaper" titled DOCSIS MCNS vs. DVB/DAVIC DVB-RCC - The Case For DOCSIS in Europe: A Cable Operator & Industry Perspective (PDF file) to complement the above Broadcom presentation.

PHYSICAL LAYER:

Downstream Data Channel

At the cable modem physical layer, downstream data channel is based on North American digital video specifications (i.e., International Telecommunications Union [ITU]-T Recommendation J.83 Annex B) and includes the following features:

· 64 and 256 QAM

· 6 MHz–occupied spectrum that coexists with other signals in cable plant

· concatenation of Reed-Solomon block code and Trellis code, supports operation in a higher percentage of the North American cable plants · variable length interleaving supports, both latency-sensitive and latency-insensitive data services contiguous serial bit-stream with no implied framing, provides complete physical (PHY) and MAC layer decoupling

Upstream Data Channel

The upstream data channel is a shared channel featuring the following:

- QPSK and 16 QAM formats
- multiple symbol rates
- data rates from 320 kbps to 10 Mbps
- flexible and programmable cable modem under control of CMTS
- frequency agility
- time-division multiple access
- support of both fixed-frame and variable-length protocol data units
- programmable Reed-Solomon block coding

programmable preambles

MAC Layer

The MAC layer provides the general requirements for many cable modem subscribers to share a single upstream data channel for transmission to the network. These requirements include collision detection and retransmission. The large geographic reach of a cable data network poses special problems as a result of the transmission delay between users close to headend versus users at a distance from cable headend. To compensate for cable losses and delay as a result of distance, the MAC layer performs ranging, by which each cable modem can assess time delay in transmitting to the headend. The MAC layer supports timing and synchronization, bandwidth allocation to cable modems at the control of CMTS, error detection, handling and error recovery, and procedures for registering new cable modems.

Privacy

Privacy of user data is achieved by encrypting link-layer data between cable modems and CMTS. Cable modems and CMTS headend controller encrypt the payload data of link-layer frames transmitted on the cable network. A set of security parameters including keying data is assigned to a cable modem by the Security Association (SA). All of the upstream transmissions from a cable modem travel across a single upstream data channel and are received by the CMTS. In the downstream data channel a CMTS must select appropriate SA based on the destination address of the target cable modem. Baseline privacy employs the data encryption standard (DES) block cipher for encryption of user data. The encryption can be integrated directly within the MAC hardware and software interface.

Network Layer

Cable data networks use IP for communication from the cable modem to the network. The Internet Engineering Task Force (IETF) DHCP forms the basis for all IP address assignment

and administration in the cable network. A network address translation (NAT) system may be used to map multiple computers that use a single high-speed access via cable modem.

Transport Layer

Cable data networks support both transmission control protocol (TCP) and user datagram protocol (UDP) at the transport layer.

Application Layer

All of the Internet-related applications are supported here. These applications include e-mail, ftp, tftp, http, news, chat, and signaling network management protocol (SNMP). The use of SNMP provides for management of the CMTS and cable data networks.

Operations System

The operations support system interface (OSSI) requirements of DOCSIS specify how a cable data network is managed. To date, the requirements specify an RF MIB. This enables system vendors to develop an EMS to support spectrum management, subscriber management, billing, and other operations.